FigureThis! Math Challenges for Families

Which of these chocolate-covered cookies would YOU eat??

mmm... chocolate

Figure This! Suppose you love chocolate. The top of each cookie is covered with the same thickness of chocolate. If you wanted to choose the cookie with more chocolate, which one would you pick?

Hint : Think about how to measure the area of the top of each cookie.

There are no simple ways to find the exact areas of irregular shapes, such as land masses or living cells. Estimating these areas can be important in land-use planning and medical research.

COMPETITIVE KIDS STEM PROJECTS

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The chocolate lover would choose the cookie with the rough edges.

Figure This!

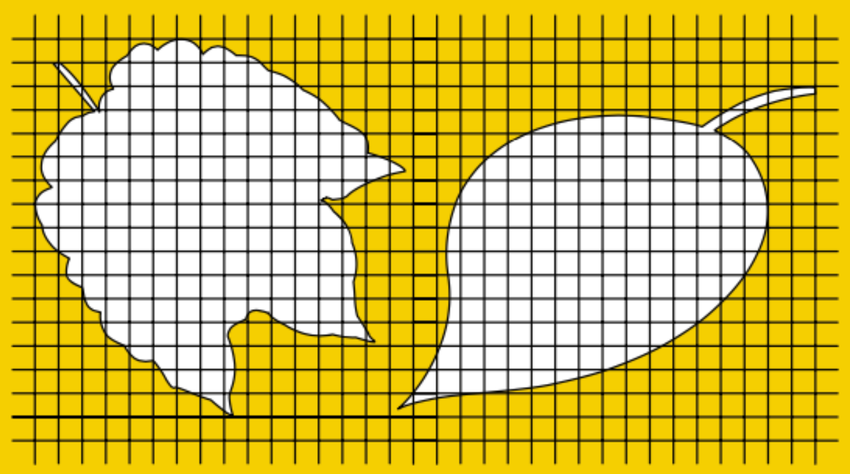
Get Started:

Trace the cookies on a sheet of paper and cut them out. How do you think their areas compare? Would graph paper help?

Complete Solution:

There are many ways to do this challenge.

- Trace the cookies on graph paper and count the number of squares each one covers. The smaller the squares, the better the estimate of the area.



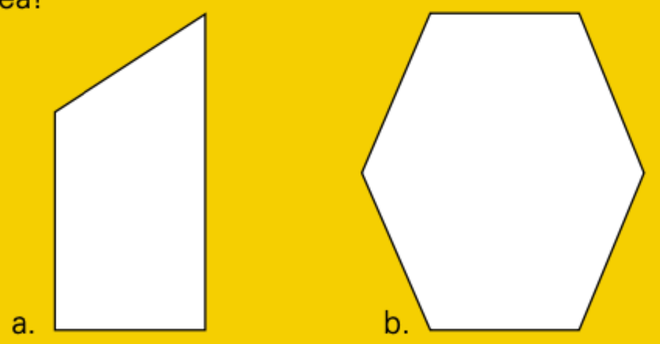
- Cut out the cookies, put one on top of the other and cut off the parts of one that are not covered by the other. Try to fill in the extra space with the parts you cut off. If you cannot cover all of the first cookie with the parts of the second, the first one is larger. If you have pieces of the second cookie left when the first is covered, the second one is larger.
- Cover each cookie with something small (cereal or rice) and then compare the two quantities.

Try This:

- Find the area of a nearby baseball field.
- Find an irregular shape in the room around you. Estimate its area.
- Draw an irregular shape on a piece of paper. Choose some point inside the shape and call that the "center." Find the lengths from the center to different points on the edge of the shape. [If a segment goes outside the shape, add the lengths of the pieces that are inside the shape. Find the average of all the lengths. Let this average be the "radius" of the shape. Use the formula for the areas of a circle (π x radius x radius, or about 3.14 • r • r). This should be a good estimate of the area.

Additional Challenges:

1. You can use a string to find the perimeter of each cookie. Some people might think that the cookie with the greater perimeter will have the greater area. Do you agree? Why or why not?
2. You can find the area of some figures by dividing them into rectangles, squares, or triangles. How could you divide the shapes below to find the area?



Things to Think About:

- Some people say that a coastline has infinite length. What could they mean by this?
- When people talk about buying so many yards of carpet, they are really talking about square yards; with yards of concrete or sand, they are really talking about cubic yards.

Did You Know That?

- Square measure is reasonable to find areas because square regions can cover a flat surface with no overlapping and no holes.
- Although you usually read only about the area covered by an oil slick, it also has volume.
- A planimeter is a tool that measures the area of irregular shapes by tracing the perimeter of the figure. A planimeter involves the concepts of polar coordinates.

Resources:

Books:

- Gravemeijer, K., M. A. Pligge, and B. Clarke. "Reallotment." In *Mathematics in Context*. National Center for Research and Mathematical Sciences Education and Freudenthal Institute (eds.). Chicago: Encyclopaedia Britannica Educational Corporation, 1998.
- Lappan, G., J. Fey, W. Fitzgerald, S. Friel, and R. Phillips. *Connected Mathematics: Covering and Surrounding*. Palo Alto, CA: Dale Seymour Publications, 1996.